THE OPTICAL

MAGIC LANTERN

JOURNAL

AND

PHOTOGRAPHIC ENLARGER.

EDITED BY J. HAY TAYLOR.

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Notices.

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Notes.

AN electric light of the capacity of six million candle power is placed in the lighthouse at St. Catherine's Point, Isle of Wight.

* * *

DURING some balloon experiments at Chatham, an attendant became enveloped in the folds of an almost empty balloon, and was suffocated from the effects of the coal-gas which it contained. Various restorative means were tried without success, when it occurred to someone present to try oxygen from a cylinder. The beneficial effect was at once apparent, and the man, who a few moments previous was thought to be dead, completely recovered from the effect in about twenty minutes.

* * *

FINE large premises have been taken by Mr. Chatham Pexton, at the corner of Gray's Inn-road, and Holborn, E.C.

* * *

A MOST exhaustive work by, Mr. J. Traill Taylor, on "The Optics of Photography and Photographic Lenses," will shortly be published by Whittaker and Co., White Hart-street, London, E. C.

* * *

MR. H. M. SMITH has arranged, in the interests of the Eastman Company, to exhibit at most of the Photographic Societies in Great Britain a large collection of lantern transparencies taken from Kodak negatives.

* * *

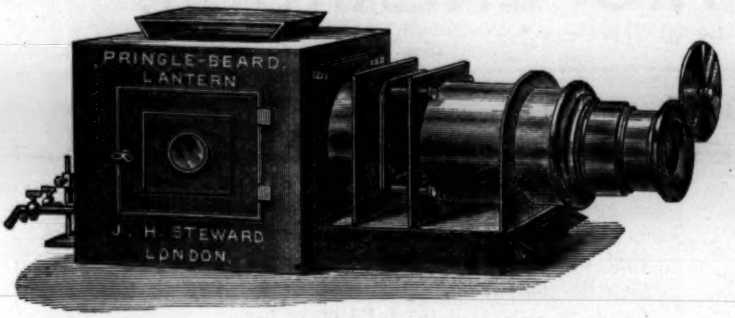
TO-NIGHT, at eight p.m., Mr. C. W. Gamble will commence his Winter Course of practical photographic instruction at the People's Palace Schools.

* * *

THE opening of the Photographic Society of Great Britain's exhibition was celebrated by a *soirée* last Saturday evening. The exhibition, which is held at 5A, Pall Mall, S.W., will remain open until November 12, and we can assure our readers that it is well worth a visit

Novelties in Lantern Matters—II.

SINCE the publication of our article, "Some Small American Lanterns," exactly a year ago, we have received numerous letters which tend to show that a small and compact lantern will be the lantern of the future. The annexed cut shows a lantern which is rigid, and can be closed up and placed in a box measuring 7in. by 6in. by 5½in. To pack this instrument up, the lens tube is first screwed in the back of the flange, then the two buttons holding the front are liberated, thus allowing the whole of the front to telescope inside of the lantern body. The jet is placed in a receptacle immediately underneath the objective.

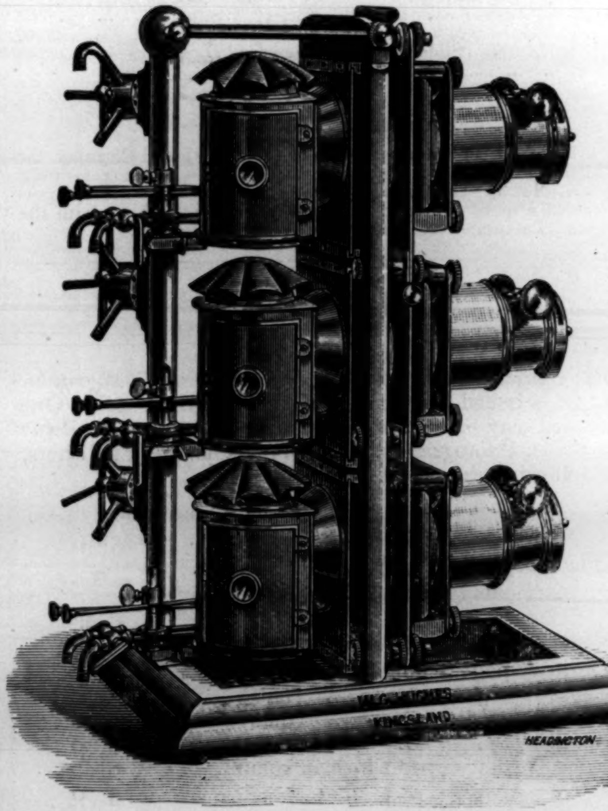


Mr. Alfred Underhill is issuing numerous slides of his own design, both plain and coloured. Amongst these we find a large number of motto slides, some comic and mechanical slides, some humorous sets—such as Photography and its Victims, and Sausage Story (with poetical descriptions). Mr. Underhill makes a special feature of effects; and he has a number of new ones, including from two to six changes.

An interesting addition to the well-known double form of slide-carrier has been patented by Mr. A. Wrench. By those who experience difficulty in removing the pictures from the carrier without soiling the surface with finger and thumb the advantage of the new style will at once be apparent. The action of sliding the carrier across the field causes the picture to become raised, so that it may be grasped by the upper edge and readily removed. This movement is effected by having moveable bottoms to the grooves in which the slide rests; these are raised at the proper time by very simple mechanism.

Thompson's Patent Brass Curtain Shutter is being made by the agents, Messrs. Newton and Co. This is a rackwork curtain shutter, which need never be removed from the lantern, and by which an up or down rolling movement can be made at any time, and yet which allows dissolving being effected just as simply as if the curtain shutter were not there.

A triple lantern must necessarily occupy considerable room; but Mr. W. C. Hughes in his New Portable Skeleton Triple has economised space, and yet been able to give what the public seem to expect in a triple—an imposing instrument. A glance at the illustration will describe it better than words.



The "Ideal" single lantern of Messrs. Archer and Son possesses several new features. The front is connected with the slide-stage by leather bellows instead of metallic tubing, and is racked out by a thumb-screw at side. A novel slidechanger is attached to this instrument, which works in connection with the well-known lightning carrier. One movement of a lever causes a semi-transparent flap to pass in front of the lens, and at the moment this is before the objective, the same lever changes the slide. As the space between the two ends of the carrier is perforated, the light is not shut off during the time the slide is passing into position. The whole movement is so quick, that the effect as seen on the screen is that the one picture suddenly becomes misty, which dissolves into a different picture. These "dissolvers" are made so that they can be adjusted to any lantern and with any focus of lens.

A few days ago we had a visit from Mr. H. Staniforth, of Sheffield, and he left with us one of his patent jet-holders. The jet is attached to a clamp, which slides on two parallel rods, the upward or downward motion being imparted by a mill-head of about 1½in. in diameter. This little apparatus, which can be fastened to almost any lantern, enables one to centre the light in a very smooth, certain, and quick manner. We understand that Mr. Staniforth, who, however, is in quite a different line of business, intends for the present to supply these jet-holders. His address is 62, Fitzwilliam-street, Sheffield.

Since the completion of their new factory, Messrs. Watson and Sons have added a few minor points in connection with their lanterns; but these are chiefly pertaining to the strengthening of various parts, and, if possible, their better construction.

It is surprising at what low prices Mr. Clark, of Royston, can supply framed slides. We have just received several from this firm, and on comparing them with his latest catalogue, we find that rack-work and chromotrope slides are only 2s. 9d. each; whilst extra designs for the latter are 1s. Lever action and comic slipping-slides are also quoted at marvellously low rates.

——:o:——

Computing Candle-Power.

In an early issue of this Journal we gave instructions for ascertaining the candle-power of illuminants employed in connection with the lantern. We then described the method popularly used—viz., casting shadows of a rod erected in front of a screen, one shadow from a candle and the other from the light being tested. The lights having been adjusted until both shadows had the appearance of being of the same density, the distance from the screen to the candle was divided into the distance between the screen and the light to be computed, and the result squared, thus giving the candle-power.

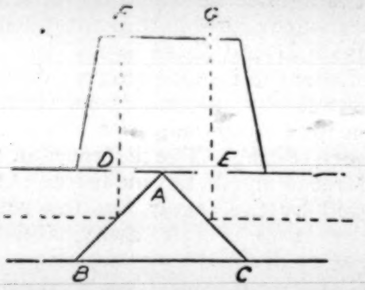
It appears that unless one is used to this mode of testing, it is not an easy matter to determine when the two shadows (which are of great contrast in point of size) have the appearance of being of the same density.

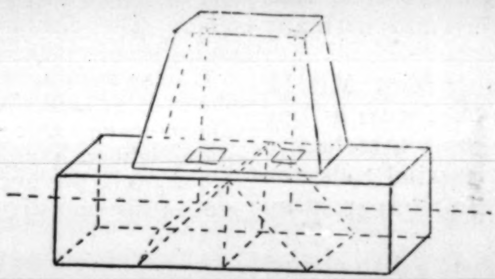
A little apparatus (Ritchie's photometer) for testing the candle-power of a light may readily be made by anyone handy with tools, out of a cigar-box and a couple of small pieces of looking-glass.

The sketches show the manner in which the box can be made. The ends must be left open, and the mirrors, A B and A C, inclined at an angle of 45 deg. The apertures at D and E are covered with oil-paper or ground-glass. The hood on top of the box contains two holes, at which the eyes are placed. The standard one candle-power, is placed opposite the end of the box, and the light to be tested opposite the other. The distances of the lights are then adjusted until the illuminations on D and E are equal.

Having ascertained that the illumination on the oil-paper or ground-glass screens are equal, we are now able to make a calculation to find out the candle-power of the light we have been testing. The distances of the lights from the apparatus must be measured; the greater distance divided by the lesser, and the result squared. Thus, if the lamp is 15ft. away, and the candle is 3ft. off, we get 15 divided by 3 = 5 × 5 = 25 candle-power; or, if L = 20, and C = 2, then 20 divided by 2 = 10 × 10 = 100 candle-power.

The question has often been asked, What is a standard candle-power? It is defined by Act of Parliament as a sperm candle of six to the pound, burning at the rate of 120 grains per hour; and for the purposes of comparing lantern illuminants this is all that is desirable; but for fine photometric calculations a candle is unsuitable, as slight variations of the wick or the composition make a difference in the exact strength of the light. About twenty-five years ago Mr. Crooks invented a lamp and fuel to represent, without any variation, a candle-power. He described it as follows in the *Chemical News*, of which paper he was at that time editor: "Alcohol of sp. gr. 0·805 and pure benzol boiling at 81deg. C., are mixed together in the proportion of five volumes of the former and one of the latter. This burning fluid can be accurately imitated from description at any future time and in any country; and if a lamp could be devised equally simple and invariable, the light which it would yield would, it is presumed, be invariable. This difficulty the writer has attempted to overcome in the following manner: A glass lamp is taken of about 2oz. capacity, the aperture in the neck being 0·25in. diameter; another aperture at the side allows the fluid fuel to be introduced, and by a well-known laboratory device the level of the fluid in the lamp can be kept uniform. The wick-holder consists of a platinum tube 1·81in. long and 0·125in. internal diameter. The bottom of this is closed with a flat plug of platinum, apertures being left in the sides to allow free access of spirit. A small platinum cup, 0·5in. diameter and 1in. deep, is soldered round the outside tube 0·5in. from the top, answering the three fold purpose of keeping the wick-holder at a proper height in the lamp, preventing evaporation of the liquid, and keeping out dust. The wick consists of 52 pieces of hard-drawn platinum-wire, each 0·01in. diameter and 2in. long, perfectly straight, and tightly pushed down into the platinum-holder until only 0·1in. projects above the tube. The height of the burning fluid in the lamp must be sufficient to cover the bottom of the wick-holder. It answers best to keep it always at the uniform distance of 1·75in. from the top of the platinum wick. A slight variation of level, however, has not been found to influence the light to an extent appreciable by our present means of photometry. The lamp having the reservoirs of spirit thus arranged, the platinum-wires parallel, and their projecting ends level, a light is applied, and the flame instantly appears, forming a perfectly-shaped cone 1·25in. in height, the point of maximum brilliancy being 0·56in. from the top of the wick. The extremity of the flame is perfectly shaped, without any tendency to smoke, without flicker or movement of any kind; it burns, when protected from currents of air, at a uniform rate of 136gr. of liquid per hour. The temperature should be about 60deg. F., although moderate variations on either side exert no perceptible influence. Bearing in mind Dr. Franklin's observations on the direct increase in the light of a candle with the atmospheric pressure, accurate observations ought only to be taken at one height of the barometer. To avoid the inconvenience and delay which this would occasion, a table of corrections should be constructed for each 0·1 variation of barometric pressure."





There is no doubt that the flame is very much more uniform than that of a sperm candle for photometric purposes. Tested against a candle, considerable variations in relative illuminating power have been observed; but on placing two of these lamps in opposition no such variations have been detected. The same candle has been used, and the experiments have been repeated at wide intervals, using all usual precautions to ensure uniformity. The results are thus shown to be due to variations in the candle and not in the lamp.

Hand-Cameras for Obtaining Slides for the Lantern.

No. 2	"Quadrant"	(W. H. Humphries & Co.)	,, June 1st, 1890.
,, 3	"Eclipse	(J. F. Shew & Co.)	,, July 1st, ,,
,, 4	"Eureka"	(W. W. Rouch & Co.)	,, Aug. 1st, ,,
,, 5	"Key"	(Platinotype Co.)	,, Sept. 1st, ,,
,, 6	"Optimus"	(Perken, Son & Rayment)	,, Oct. 1st, ,,
,, 7	"The Griffin"	(Griffin & Sons, Limited)	,, Nov. 1st, ,,
,, 8	"The Swinden-Earp" Patent		,, Dec. 1st, ,,
,, 9	"Collins"	(C. G. Collins)	,, Feb. 1st, 1891.
,, 10	"Kodak"	(Eastman Co.)	,, Mar. 1st, ,,
,, 11	"Guinea"	(Walter Griffith)	,, April 1st, ,,
,, 12	"Vanneck"	(Watson & Sons)	,, May 1st, ,,
,, 13	"Chadwicks"	(W. I. Chadwick)	,, June 1st, ,,
,, 14	"Bonanza"	(R. & A. J. Mercer)	,, July 1st, ,,
,, 15	"Repeater"	(Cusworth)	,, Aug. 1st, ,,
,, 16	"Marvel"	(Wilson & Son)	,, Sept. 1st ,,

No. 17.—"TALMER."

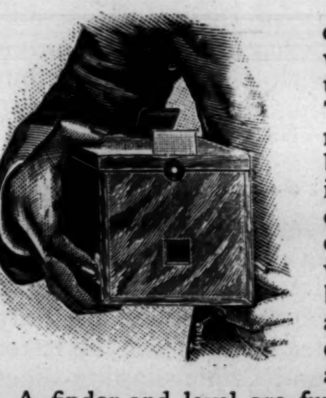
In the "Talmer," Messrs. Talbot and Eamer, of Blackburn, have provided a camera which is compact and convenient to use. It is of polished mahogany, holds twelve quarter-plates, and measures 5in. × 5in. × 9in.

The plates are contained in sheaths, which are stacked one behind the other in the reservoir of camera, and are changed by means of the well-known changing-bag, which in this camera differs from others in shape. In this case the bag is a flat one; this renders it not only easy to grip the plate to be changed, but it is also readily packed away.

The plates are raised into the bag by a metallic lifter at side of camera, which returns to its original position when liberated. The action of this lifter also sets the shutter for the next exposure, so that there is little chance of exposing the same plate twice. Inside of the lid which covers the changing-bag is a numbered ivorine slab for noting particulars of exposure of the different plates.

The camera we tried had a R.R. lens (they are also made with single achromatic lenses) with the shutter working between the lenses. Either instantaneous or time exposures can be made; for the former, the released trigger is pressed upwards, while pressure downwards allows the shutter to remain open until pressed upwards. Means are provided for regulating, to a certain degree, rapid exposures.

The stops for lens are on a rotating diaphragm, which can be set from underneath the camera. The number of plates remaining unexposed can be readily ascertained, for in the bottom of the camera is a small strip of ruby glass, through which may be seen the bottoms of the sheaths, and the relative position of the division-plate thus ascertained.



A finder and level are furnished with this camera, which is one of the most convenient and finely-finished instruments we have used.

The Hackney Photographic Society's Exhibition for 1891 will be held at the Morley Hall, Triangle, Hackney, on Wednesday and Thursday, October 21 and 22. Sir Charles Russell, Q.C., M.P., has kindly consented to perform the opening ceremony. Messrs. J. Traill Taylor and And. Pringle will act as judges. In addition to the usual display of pictures for competition, the committee have arranged for popular entertainments on a very liberal scale, and will include concert and organ recitals (by Mr. Jno. E. West, F.C.O., and other well-known artistes), working trade exhibits, optical lantern displays, exhibition of photographic apparatus, &c. The prize distribution will be held on Thursday evening, when four gold, eight silver, and three bronze medals, besides other valuable prizes, will be awarded. Admission each day, one shilling. Doors open at four p.m. Further particulars and conditions of exhibition can be obtained of W. Fenton Jones, hon. sec., 6, Victoria-street, King Edward-road, N.E.

Hints and Helps.—No. 2.

By C. E. Rendle.

ALUMINIUM FOR LANTERN BODIES.

By referring to the Table of Specific Gravities (page 146) the reader will at once notice the wide margin in the relative weights of platinum and aluminium, for while the former is, as stated, the heaviest body in metals, the latter, on the other hand, is the lightest—so light is it, in fact, that you must take it in bulk in your hand before the difference can at all be realised. I wish it to be understood that the figures in the table are for aluminium pure, not an aluminium amalgam. Why this is mentioned will at once be evident, for the alloys employed being of bronze and brass, its weight is naturally greatly affected.

Its cost can be answered in the three words, "That's all right." Allow me to quote from the last report of the Aluminium Company, Limited, issued a few days ago, which will at once confirm this: "The difficulties in which the company found itself were due to the phenomenal fall in the value of aluminium, which, in consequence of the introduction of electrical processes of manufacture, now sold for little more than one thirtieth of its price at the time the company was formed." Again, "Five years ago it stood at 60s. per pound, last year it had fallen to 6s, and now it stood at 2s., at which price it was quite impossible for the company to manufacture at a profit." Therefore a fair estimate of its cost prepared for working purposes would be 4s.

Whether it has ever been tried for lantern bodies the writer is not in a position to state; possibly not, for manufacturers generally do not attempt anything fresh unless it can be proved without the shadow of a doubt, the ultimate results and advantages to be derived. This cannot be shown, as far as I know at present, as the following brief facts will demonstrate. For small articles, where strength is not of much consequence, it has been used for years, and for lens mountings, opera-glasses, and optical goods generally, I think it most desirable, but my readers will agree, we cannot do with a lantern of less strength and durability than our present iron friend, or say, the lining of the wooden case of our bi-unial; and this cannot be had in aluminium without increasing its bulk and that we wish to avoid. It is not at all a strong substance, difficult to solder, and even when soldered, not at all reliable; there is something, in fact, about its working unsatisfactory, and something that up to the present I have not been able to master, therefore cannot sing its praises for lantern bodies. Its melting point is 1,800 deg. Fahr., whereas that of cast-iron is 2,786 deg.

It takes a high polish and stands out in rich relief when placed beside the finished brass-work that is always so much admired at our photographic exhibitions. The next time I touch upon it I hope to be more encouraging, and having experiments now in hand, it may not be very long.

——:o:——

By shutting one eye when viewing lantern slides on the screen, a stereoscopic effect is presented to view.—*S. Frith.*

Colouring Lantern Slides.—No. 4.

By A. W. Scott.

(*Continued from page 145.*)

Skies.—The colouring of skies in lantern slides is, perhaps, the most difficult part of the work, as it is necessary to use great care to avoid spottiness and dust. Before commencing to dab, we may examine the surface of the photograph to see if it be smooth and free from scratches. In the case of a gelatine transparency, the surface may be gently rubbed over with a piece of linen moistened with methylated spirit, to remove any dust that may have adhered to the gelatine during the drying; any parts of the picture which seem too dark and opaque may be reduced and lightened at the same time by continuing the rubbing on those places. When the gelatine surface is perfectly smooth and even, we may apply the varnish colour direct on the film; but if there are scratches, a coat of spirit varnish may be applied by flowing it over the warmed plate; this varnish causes the scratches to be nearly invisible, whereas, if they were filled with paint they would form unsightly blemishes. Sometimes it is necessary to scrape off the sky of a photograph, on account of defects, which could not well be disguised in the colouring. A sharp penknife is useful for this work—it should be applied with care on the horizon, or around any objects, such as buildings, which may project into the sky. After the scraping, the glass should be spirit-varnished, to cover up the ridges left by the knife, and produce a surface approximately flat. Spirit varnishes vary in composition; some containing substances soluble in turpentine, such as canada balsam, resin, and mastic; these are useless for slides, as it would be very difficult to dab upon such a basis, owing to it becoming soft and sticky. There are good varnishes in the market, composed mainly of seedlac and sandarac, dissolved in spirits, which are suitable for slides.

Sometimes the sky of a photograph is not exactly defective, but is simply too dark to admit of a bright sky being painted upon it. In such cases we may frequently obtain excellent twilight and evening effects by applying a little colour to the dark ground, and afterwards cutting out some high lights with the penknife, to represent the moon or stars, while other lights may be scratched in the windows of houses, and tinted with gamboge and rose madder.

Clouds.—We have previously described how a plain blue sky is painted; the colour is applied by dabbing, and made as even as possible, allowing the colour to spread beyond the boundaries of the sky space; when the stippling is finished the surplus paint may be removed by wiping it off with a stump, moistened with turpentine or magilp. A few small cumulus clouds may be introduced with good effect by wiping away the colour in parts with a bit of washleather stretched over a small chisel-pointed stick. The upper edge of the clouds, and the side facing the supposed position of the sun, should be well defined, while the lower portions may be softened into the sky tint by a little dabbing. A purple grey tint—somewhat darker than the sky—may be put in at the base of large cumulus clouds; but in small white clouds it is not usually required.

Cirrus clouds are light and fleecy, floating high in the air in fine weather; they may be represented by lightly touching the wet paint with a corner of the washleather, or with the tip of a dry brush, so as to remove the colour in an irregular manner.

Stratus clouds lie in long streaks, usually more or less parallel. When not horizontal they sometimes appear in perspective, all the lines pointing towards one particular part of the horizon, which is the point of sight, the lowest streaks being nearly horizontal, the upper ones sloping the most. There are several kinds of stratus clouds, such as cumulo-strato, cirro-stratus, &c. They are painted in a manner similar to the cumulus and cirrus clouds.

Nimbus, or rain clouds, are dark blue or purple masses, darker than the sky tint. There are two ways of painting them. One is to put in the clouds with water-colour previous to dabbing in varnish colour; the other is to dab the sky tint first, and then allow it to become thoroughly hard and dry, afterwards putting in the clouds with the brush. Either method will give good results, but the latter is the best, if time be not an object.

Sunsets offer a wide field to the colourist, and are frequently represented in lantern slides, owing to the brilliant effects obtainable with them. The simplest evening effect is to put in a pale blue sky at the zenith, and a warm tint—generally orange—at the horizon, the two being blended together into a grey at the line of junction by dabbing, the shadows of the foreground being made of a purple tone.

When the atmosphere is hazy the setting sun may be of a bright golden colour on a rich orange sky, which becomes darker and colder as the distance from the sun increases, until it becomes merged into the blue or purple of the zenith. The clouds over this sun would have brilliant golden edges on the under side facing the sun, while the upper portions would be dark grey or purple. Any near objects, such as trees and buildings, standing before such a sky, would appear almost black by contrast with the bright light.

To paint this sky we may begin by dabbing an even tint, pale blue or purple, at the zenith, changing gradually into bright orange, about the position where the sun is to be. The light clouds may be carefully picked out with the washleather, after which the slide should be well dried. A circle is next scratched near the horizon for the sun, and tinted with yellow. The orange tint about the sun may be deepened by applying more colour with the brush, and the golden clouds may be tinted at the same time. A purple grey tint may be brushed on the dark portions of the clouds, and also on the horizon under the sun, if not very distant. A little black may be required on trees and the like standing before the sky, the best way of representing a luminous sky being to contrast it with some objects in deep shade.

Any dust specks which may be visible should be picked off with the sharp point of a penknife, preferably when the colour is dry. If there be still water in the picture, it will reflect the colours of the sky precisely like a mirror; but when the water surface is ruffled the colours will be broken up and intermixed, while in some places the reflected tint will be that of the zenith. When the slide appears satisfactory to the eye, it may be tested in the lantern, as the appearance on the screen is the chief consideration. This testing should be done, if possible, by limelight, the strong yellow tinge of oil-light rendering it difficult to judge the colours correctly. Probably some little defects will become visible, requiring further touches of colour; and perhaps there may be some dark patches, indicating want of transparence, which can generally be cured by giving the slide a thin coat of mastic varnish at these places.

(To be continued.)

—:o:—

The Lantern Microscope.*

By T. E. Freshwater.

It is not my intention to say anything about the light, as that is well understood; but a few words on the construction of the microscope will not be out of place.

The condenser is a triple combination. The first pair are plano-convex lenses of 5in. in diameter, with their convex sides facing each other; the third lens, that is the one nearest the light, is a rather deep meniscus of 4½in. diameter. The lenses are mounted close together; the whole set then measure 2½in. in focus, thus enabling the light to be put in such a place as to take up an angle of 95deg. This will bring the rays to a focus, if let alone, at about 6in. in front of the front lens. In the convergent cone of rays from the condenser is placed a parallelising plano-concave lens, giving a parallel beam about 1½in. diameter. Here is placed the alum trough; the concave lens is balsamed to the glass side of the trough, thus forming on this side a double plate of glass The layer of balsam absorbs any special balsam heating rays which may get through the alum solution. Without this tank of alum to absorb the heat, one would not be able to show any objects, as they would be burnt up almost directly.

From the parallelising concave lens to the stage is about 5in., and in this parallel beam of light is placed the substage condenser, which focusses the rays on to the object. This lens is about 2½in. focus, and will brightly illuminate an object 1½in. in diameter. Such a lens can be used for all low-power work, from a 3in. objective to a four-tenth.

The position of this condenser depends upon the objective used—the higher the power, the farther must the condenser be racked back. For high-power work a double lens is necessary, and when immersion lenses are used, a small very high-power lens is put on in front of the second lens, thus making a triple substage condenser, which enables you to get a very small spot of intense light on the object.

Following on from the substage condenser to the objective, any objective will do; but those worked out on purpose for screen work give the best results: a flatter field, more light, and far better definition. Sometimes it is desirable to increase the size of the image without changing the objective; this may be done with an amplifying lens. The image is amplified for ordinary objects by interposing a plano-concave lens between the objective and screen somewhere about 4in. in front of the objective. The effect of this lens is to increase the working distance between the object and the objective. For photographic purposes the amplifier should be corrected; but for ordinary work a single lens is quite sufficient. In place of this lens may be inserted a microscope body-tube with an eye-piece. The eye lens should be achromatic, and so made that it is adjustable, in order to enable you to focus the stop of the eye-piece on the screen, and this arrangement gives very fine results.

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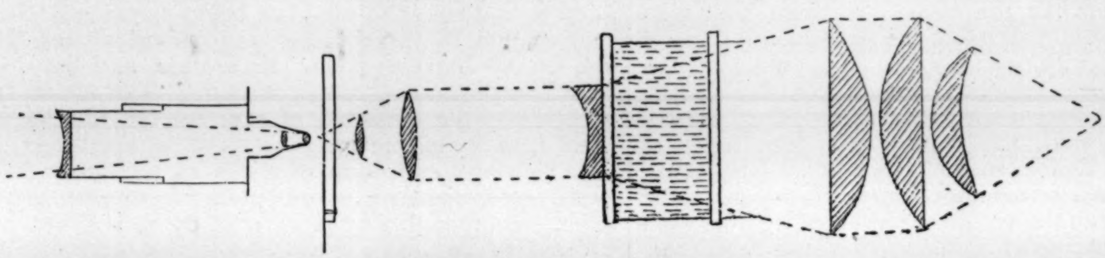
* London and Provincial Photo. Assn.

I have not said much about the objectives; but the most useful lenses range from a 3in. down to four-tenths, which, with an eye-piece, may be worked up to 15,000 diameters. This means a Blow Fly's tongue 14ft. long at 25ft. distance, but immersion lenses of one-eighth or one-twelfth may be readily used.

It must not be forgotten that the projecting microscope produces its image under some conditions which interpose some peculiar difficulties. The first difficulty lies in the enormously-greater amplification necessary; this does not produce a proportionate effect upon the spectator, owing to his greater distance from the image; but on the other hand, any errors in the objective, with their consequent woolliness in the image, are magnified proportionately; 1,200 diameters is considered high on the compound microscope in ordinary work, but a very moderate power for screen-work. The second difficulty is a consequent deficiency of light, which makes it difficult to exhibit images of transparent objects, such as diatoms. When we look at such a diatom as *arachnœdiscus*, it can be easily magnified to a foot across, but a few feet away would not be seen. When this is amplified to 3ft. the blacks are dilated into greys again. To get a critical image the photographer can stop off a great deal of this light. This he can well afford to do, because he can make up for the loss of light by longer exposure, which the demonstrator cannot do.



LANTERN MICROSCOPE.

Having described the instrument, I will say a few words on the different parts of the apparatus and class of objects that can be shown with it. I will first take the spot lens, or dark-ground illuminator. By this method of illumination, objects such as some of the spicules of sponges, synapta, and stagnant water may be shown.

The Lieberkuhn is a very beautiful addition to the instrument, for showing opaque objects. This is a circular reflector, which fits over the objective, and worked to such a curve that all the rays of light that come from the condensers are received on to the reflecting surface, and thrown back upon the object, which is again reflected through the objective on to the screen, so that the more brilliant, the brighter will the image be on the screen. The feather of the humming-bird, small shells, and beetle wings are very pretty shown in this way.

The polariser is placed in the body of the instrument, so that the parallel beam travels along the whole length of the prism to the object, and the analyser is worked in front of the objective. The last part I have to say anything about is the convergent system of lenses, which consists of a set of three lenses of very deep curves, fitted in the place of the substage condenser, for showing the brushes and rings in highly convergent light.

In front of this set of lenses is placed the crystal; in place of the objective is another set of lenses of smaller diameter, nearly bringing the rays to parallelism; then a lens in the rack tube to focus the image on the screen, the rays from which cross in the analyser.

—:o:—

Stereoscopic Effects with the Optical Lantern.

BY OSCAR S. TEALE.

(Continued from page 148.)

WE often see pictures taken with lenses of most wonderful depth of focus, objects at great distances appearing—so far as the eye could detect—quite as sharp as those in the foreground, but the result is a flatness, a want of atmosphere; and it is only with mental effort, gauging the proportionate size of the distant objects to those in the foreground that one is enabled to calculate, or even approximate, the distance intervening.

On the other hand, the more correct representation of monocular vision is obtained from a lens with comparatively little depth of focus, or when a lens is manipulated so as to throw the background out of focus, in which case objects in the foreground are made to appear sharp and distinct, while the more distant parts are hazy. This is literally true to nature, inasmuch as when the eye is focussed on an object all surrounding forms become indistinct, void of sharpness and mere suggestions of form, assuming more definite shape only when the line of vision is changed and focus of the eyes brought to bear directly on them. This brings us in contact with the most difficult obstacle to overcome, and face to face with conditions of the natural vision that cannot be imitated or compensated.

As no law of the science of optics can be made to perform all the functions of the human eye automatically, as it does, it is therefore practically impossible to represent nature exactly as we see it. In nature the conditions of the sight are ever changing; we are constantly and unconsciously shifting the position of the eye, contracting or dilating the iris, shutting off or increasing the needed supply of light, as the changed condition demands; the eye rolling about in its socket responds to every demand or dictate of the brain. This augmented by the natural and unconscious movements of the head and body brings an ever-varying landscape or condition of view before the mind, until an arc is described embracing an angle of 180 deg. and upward.

These varying conditions cannot be provided for in the science of optics, since the science can only be based upon fixed conditions and fixed principles.

Science, so to speak, can see objects from one point of view only at one and the same time. Hence, if one eye is focussed or rested on the subject or the picture, the other eye being closed, and if the distance the picture is held from the eye coincides, or even approximately coincides, with the optical focus of the lens with which the picture was taken, the relief effect will be quite apparent to the naked or unaided eye.

The "Cosmorama" is an instrument which demonstrates the above fact, and serves well to illustrate the relief effect that may be produced from a flat picture, a line drawing, painting, or photograph; though generally for viewing photographs under the same conditions a "graphoscope" is employed, which is an instrument constructed on precisely the same principles. The relief in these instances results from the axis of the cosmoramic or view lens being fixed at the proportionate or mathematical point of station or distance from which the picture was originally made. The picture in this instance differs from the one prepared for the stereoscope, being single, and when viewed with two eyes through one lens, which must be a double convex one, the visual rays from both eyes are conveyed and directed to the same identical point of the picture, with precisely the same effect on the mind of the spectator as is produced in viewing nature on the mind of the monocular-visioned person. As has been said, the cosmoramic lens must of necessity be a double convex one and of long focus, as against the stereoscopic lenses of the prismatic form which keep the visual rays proceeding from each eye separate and apart from the other, and direct them at proper angles to the pictures.

Another element of relief, more especially in the case of monocular vision, is demonstrated by that rule in the art of ærial perspective—viz., the highest light appears immediately next or adjoining the deepest shade (shade and shadow are two separate elements and must not be confounded). For example, a building viewed at an angle of 45deg. more or less with the picture plane and where the sun's rays fall full on one side only, it will be observed that the corner of the building nearest the eye will appear brilliantly lighted, while the light will apparently fade away and diminish as the plane of the building recedes from the eye, because of intervening atmosphere. On the other hand, the shaded side of the building will appear darkest at the immediate corner next adjoining the highest light and the more distant parts of this shaded side becoming less dense because of atmosphere and also reflected light, the atmosphere itself serving in a measure as a reflector.

In reality, the density or transparency to all parts of the shaded or illuminated sides of the building would under the same conditions be equal, but to the eye the gradation of both light and shade is due largely to the strikingly marked contrast defined by the sharp corner of the building. The eye also perceives the same gradual indistinctness of detail as its distance is increased from the near corner of the building, for the same reasons. An entire paper might be devoted to this subject of light and shade, perhaps with some profit, but we have not digressed from our text in the casual glance we have cast at the "bright and the dark side of the picture," for without these elements the perspective relief would indeed be reduced to a minimum.

Perhaps the best example of relief as produced or effected by the play of light and shade will be found in representations of statuary, in which cases sharp lines, angles, and flat planes are of rare occurrence; consequently the foreshortening and diminution resulting from parallel lines converging is in a measure lost to the eye. Statuary effects may therefore be considered an exception to the rule. Being largely illusive rather than a natural condition of sight, people imagine they see full relief in such cases; they do not fully comprehend what true relief is; they mistake contrast for stereoscopic effect.

This contrast is the result of light and shade augmented by a background of a dark shade of colour, generally a dead black, which gives an amount of prominence to the white subject, illustrating in a marked degree the fact as presented by the famous Ruskin—"that in nature there is no such thing as outline, but all forms are the result of one patch of colour against another, as, for example, a cow in a field is in reality a patch of red on a field of green colour."

However, the true conditions of perspective exists in these statuary subjects, but being composed of a combination of curved lines and curved planes, the line of the horizon is not discernible, and the distorted perspective is not so striking. The eye being deceived by the elements of contrast, the illusion of relief is easily effected.

In viewing a collection of slides as ordinarily projected, some appear to stand out in fair or even good relief, but invariably upon close study it will be discovered to be a mere coincidence, the conditions of perspective being, by chance, approximated, but even then it becomes necessary to draw upon the imagination to complete the illusion.

A most wonderfully interesting combination of binocular and monocular vision is furnished in the "Cyclorama," where the natural and the artificial are so dexterously combined and blended that it is quite difficult, if not impossible, to detect where the natural features representing the binocular end and the painted parts representing the monocular begin, and the changed condition of vision is so adroitly managed that the illusion is perfect. I recall a visit to the cycloramic exhibition of the "Siege of Paris," when, as my eyes rested on a cosy gothic cottage just beyond the middle distance, after viewing it from my original position I unconsciously moved to another point of observation with a desire to get a glimpse of the opposite side of the building, and was only brought to a realisation of the error of my misguided judgment upon arriving at the new point of vantage only to behold the identical view of the building that my former position had revealed.

I immediately administered to myself the well-merited mental chastisement for my absent-mindedness, whereupon I heard the barking of a dog, and my eyes at once following the direction of the sound, eagerly looked for the intruder in an open field then lying directly before me, but alas, once again the enchanted spell was broken, and I turned to my normal state of mind with the (theoretical) consciousness that I was only viewing a flat and not a natural landscape; the dog was beneath the platform I was standing upon and quite invisible to my eyes. This was to me indeed a most extraordinary perspective representation, such as I had never even dreamed of, and an illusion the effect of which I shall in all probability never forget.

The secret of this beautiful work of art lies in the strict observance of the rules of perspective, the perspective horizon being fixed for all observers, and the distance of observation, or the "point of station," being unalterably established by the position of the platform, representing a housetop, from which the observation was made. The effect thus obtained is stereoscopic to a very high degree, losing nothing by the use of the opera-glass, because the foreground and near distance is composed of real forms, while the painted parts are representations of such distant parts and the angle of view is so acute that the lack of solidity is not realised.

The requisite atmosphere effect is obtained by the judicious use of colour and an ingenious arrangement for illuminating to a proportionate degree both the foreground and distance.

It will be observed from the foregoing consideration of the various methods of producing the relief or stereoscopic effect, that in every instance art and artifices are resorted to, to obtain the desired results, and that the conditions named in each case are absolute, and that disregard of any would prove fatal to success.

Just so certain conditions must prevail, or artifices resorted to, if we wish true stereoscopic effect from the optical lantern. Much has been written on this subject, but so far as I have been able to discover, all writers appear to have—through ignorance of the subject or otherwise—lost sight of the vital principles of perspective, without which relief representations are impossible, as shown by what I have previously said in this paper.

One condition which cannot be ignored is the "point of station," or point of observation, or, in other words, the position occupied by the person who would behold the projected picture in all its stereoscopic beauty. It will be remembered that, under all conditions or methods of obtaining the relief effect, this point of observation has been at a fixed distance from the picture plane, and in certain relative position laterally, thus reducing the area of correct observation to a very limited prescribed compass, which renders the possibilities of the enchanted view to the limited few who may be fortunate enough to occupy a place within the "charmed circle," so to speak. There is in reality only one absolutely correct point of view, inasmuch as the picture is taken from one point; hence it would follow that only one person in the specified "charmed circle" can occupy the mathematically correct point of station, to see the picture just as the lens of the camera received it, all others within this prescribed circle getting only an approximately correct view, the angle of the visual rays proceeding from the eyes of each varying so little from the normal rays that the distortion is not perceived by them, the mind performing the service of registering and adjustment.

As I have said, previous writers have evidently not been able to account for this limited field of view; this inference is drawn from an article which recently appeared in the *Scientific American* supplement, copied from *La Nature*, and from which I quote: "The stereoscope, such as we know it, presents the inconvenience of being incapable of being used by but one person at once. Several inventors have endeavoured to render the stereoscopic images visible to several spectators at the same time. Continuing, it says:—

"In 1858, Mr. Claudet conceived the idea of projecting the two stereoscopic images upon ground glass in superposing them. The relief was seen to appear, but we cannot very well explain why; the idea, however, had no outcome, because the image, being quite small, could be observed by but three or four persons at once."

(To be continued.)

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How I Became a Lanternist.—VII.

By the Vice-President of the Lantern Society.

(Continued from page 135.)

Owing to my absence during a cruise on the Shannon and broads of Ireland, I missed sending my jottings for the last issue. Meanwhile, I have read Mr. C. R. Rendle's communication, regarding light metal lanterns, and I am very much obliged to him for the way in which he has dealt with the question, and also for the facts he states in giving the weights of various metals.

However, it is a fact, that there is an undoubted demand for small handy lanterns, and a good many people will sympathise with Mr. Duncan Milligan, who writes in *Help* for September, whose ambition it is to carry lantern, sheet, and slides, in his hands, and go from conveyance to conveyance, set up an exhibition, pack up and return home without fees and costs. I have gone into these things already, and therefore need not allude to them again. One of the troubles, however, in addition to having a somewhat heavy lantern to get about with, is the lantern screen. I have a comparatively handy and portable one with its feet and jointed poles, but it is not perfect, and I do not see how we are going to have a thoroughly splendid screen—I mean a screen with a surface something like Mr. Tyler's, which is undoubtedly the best that I have come across—which at the same time can go into a small compass. The trouble is in having anything a dozen feet in length to get about with, and the problem is how to get over it. I may, however, make this suggestion, that cotton is capable of taking a dressing which shall firmly adhere to the fibre of the material and which will obstruct the light very considerably. At any rate, so dressed it would give a ten per cent. better field than the average cotton sheet which we use at present. Let me make a few suggestions, and perhaps some practical maker will proceed to put them into practice with ten-horse power implement of his own. Let the sheet be ten or eleven feet square, absolutely without seam; let it be dressed with some material that shall fill in the material, as it were to obstruct the light and make it *as a calico sheet* as opaque as possible. Let the sheet be made, not with tapes sewn on, but with proper eyelets, and these rather stout ones let in (say) about every two feet apart, all round it except the top, and this might have a hem, in which what we will call the bearing bar or pole might be inserted. In each of these eyes let a piece of tape be tied and sewn to prevent it coming away; but the tape requires to be strong so that it will last, and also that it may hold with one hitch to save having to tie and untie it in a bow. By these means we could get a sheet that would be perfectly taut.

Now we have another difficulty to get over. We must have the sheet perfectly taut. The conditions suggested will but partly do that. A frame must be designed that shall have a spring more or less all round. By good material and being well fitted, it will attain this, I think. Again, an ordinary portable frame carrying a sheet always has a warp, which is most objectionable. The two top corners must be at a perfect angle with the bottom struts and with the lantern, and the way I propose to do this is to have fitted a gye with the ordinary tent "slide," running from the *top* down to the two ends of the struts, or feet—one aft, one forward, as the sailors would express it—that is to say, two gyes from the very top at each upright by hauling on or slacking off a slight amount of rope, so to "draw" sheet to angle of lantern; also, a perfectly perpendicular erection could be obtained when desirable.

Now let us knock this sheet to pieces. The feet on the ground, we will say, which shall have sockets to carry uprights and bottom cross-bar, are, say, 4ft. long, made of exceedingly light wood. The bars are, of course, 5ft. 6in., with unjointed brass ferrule in the centre of each piece, which is essential. The corners might be either made with a patent angle-clip, or to run into socket, the old-fashioned simple way; but the angle sockets are not nice. The whole weight of this apparatus when folded up into stout canvas bag, with leather strap securely sewn on to same for keeping all snug and for carrying purposes, ought to weigh not more than a stone and a quarter, if it is to be really and genuinely portable. Can it be done? A good and portable screen that is not too big for a small room, and which will serve on a make-shift for a larger place, is a desideratum for which hundreds of men are looking. The nuisance of having to nail up a sheet which cannot be stretched, and all the other temporary arrangements which we sometimes have to resort to, are at the best most unsatisfactory. I ought to add that such metals as tin should be eliminated, and everything in the nature of paint should be eschewed. Let the thing be genuine and good.

A Portable Opaque Screen.

By Henry Field.

For a long time I put up with the inconvenience, referred to by Mr. Altman, of taking about with me, when going to give a lantern entertainment, the long pole, which seems to be the usual appendage to an opaque screen. The inquiry in last Journal was for a material which can be folded up, and will not show the folds too prominently when opened up, and yet be opaque. Now I had been looking for just such a thing for a long time past, and when I read in *The Optical Magic Lantern Journal*, some months ago, that mackintosh was suggested, I at the time intended to send to its columns particulars of the style of opaque screen I employ, but somehow it escaped my memory. However, the query in last issue brought my good resolutions to mind again, and I will endeavour to give, what I have obtained a vast amount of from the columns of this Journal—information of a practical kind.

Now this screen question is not by any means a difficult one, but it must be remembered that "there is no gain without a loss." The gains in this case are more light upon the screen in consequence of its opacity preventing the light penetrating the material, and thus a large percentage of it becoming lost. Another gain is in the size and convenience of the package in which the screen may be made up.

But now for the loss side of the question. With the opaque screen on a roller there is nothing to do once the hall or lecture-room is reached, but to hang it up. In the method I adopt there is a little trouble required after the screen is erected, and a reasonable time must intervene between the time of erecting the screen and the time at which it can be used; but, "taking one thing with another," as the song says, the balance of advantages are in my favour, especially if the screen has to be taken any distance.

As far as the material of the screen is concerned, any of the ordinary commercial screens made of calico or linen will answer admirably. These, of course, can be folded in a comparatively small package, but after the screen is erected it must be whitewashed with an ordinary whitewashing brush. This is applied to the front surface of the screen. Of course it must be allowed to dry before being used, but as the drying takes place from the back as well as the front surface, this is only a matter of about twenty minutes. But when the screen is dry, we have a fine and even surface, devoid of any blemish, and last, but not least, an opaque screen like a piece of cardboard.

It may be said that this is all very well while the screen is in its place, but it has to be taken home again—how then? Nothing is simpler; rinse it out in water, and the whitewash will speedily leave the fabric as limp as possible, and after it is rung out wrap it in a piece of mackintosh, and the dampness will not injure anything among which it might be placed. I have a small mackintosh bag for the purpose.

Just a word more. I do not claim the idea as original. I first saw the idea in Berlin, where I have seen it adopted by several lanternists. The apparent whiteness is increased if a very little blue is mixed with the whitewash.

Society Meetings.

Brechin Photographic Association. — The annual general meeting of the above was held on the 9th ult., the president, William Shaw Adamson, jun., of Careston, in the chair. Six new ordinary members were admitted—viz., Rev. T. L. Ritchie, Messrs. G. T. Robertson, B.Sc., A.M.I.C.E., G. M. Scott, J. Buchanan, Innes, and Smith. The annual reports of the secretary, treasurer, and curator were read and adopted, and on the motion of the president these officials were thanked for their services. The report of the sub-committee appointed to revise the rules was adopted, and the new rules agreed to. The night of meeting has been altered to the third Wednesday of the month. The office-bearers for the coming year were elected as follows: President, William Shaw Adamson, jun., of Careston; vice-presidents, G. Mackie, A.Ph. S., and H. Braid; secretary, James D. Ross, 6, High-street, Brechin, N.B.; treasurer, Mr. Innes; curator, J. C. Middleton; committee, Messrs. Ferguson, Buchanan, and Dakers. At a meeting of the committee of the above association, held on Thursday evening, the 24th ult., it was agreed that an effort be made to prepare sets of lantern slides, illustrating the various industries in Brechin. The secretary was instructed to write to the various manufacturers in the town, and the managers of the East Mill Company, Limited, asking permission for the members to photograph their machinery for this purpose. Should this endeavour be successful, it is intended to take up paper-making, distillery work, &c.

Leeds Photographic Society. — Lantern Slides and Transparency Making.—On Monday evening, 21st ult., Mr. G. H. Rodwell gave the sixth of the series of elementary lectures, his subject being Lantern Slides and Transparency Making. Mr. Rodwell stated at the outset that the increased popularity of the optical lantern as a means of instruction and amusement may be accounted for by the fact that the modern dry plate gives to the amateur facilities for making lantern slides not possessed some few years ago.

Liverpool Amateur Photographic Association.—The seventh ordinary meeting of the twenty-eighth session was held at the association's club-rooms, 3, Lord-street, on Thursday, August 27. The chair was occupied by Mr. Paul Lange (president), and there was a very large attendance of members. In the absence of Mr. Wm. Tomlinson, Mr. John Wells reported on the excursion to Knowsley Hall on August 6. In the unavoidable absence of Mr. F. Anson, who was to have read a paper and practically demonstrated the making of "Home Sensitised Paper," Mr. J. H. Welch, at very short notice, gave a demonstration on the working of the Blackfriars Photographic and Sketching Co.'s new celerotype paper-exposed prints, some of which had been prepared by the hon. secretary, and showed the variety of tones obtained by stopping the development at certain stages. The proceedings concluded with the exhibition, by the aid of the society's limelight lantern, of about two hundred lantern slides (the prize slides of the Liverpool International Photographic Exhibition), and which now form a handsome addition to the collection of valuable slides, the property of the society. Mr. Thomas S. Mayne described the slides in a graphic manner, and Mr. P. H. Phillips skilfully manipulated the lantern.

The Midland Camera Club.—A provisional committee meeting was held on the 18th ult.; Dr. Hall Edwards occupied the chair. It was reported that the club-rooms were being arranged for, as also the furniture and fittings. The draft rules were discussed and adopted. Mr. J. Trout and Rev. J. Henry were added to the provisional committee. The objects of the club, according to the adopted rules, are as follows: "The objects of the club shall be the advancement of photography in all its branches and the promotion of social intercourse amongst all photographers. First—by the holding of periodical meetings for lectures, papers, discussions, and practical demonstrations; and by friendly competitions upon photographic subjects. Second—by the provision of convenient club-rooms, with dark room, &c., for the use of members. Third—by the promotion of intercourse between this and other societies." The membership is to be quite open to both amateurs and professionals, ladies as well as gentlemen. The subscription has been fixed at ten shillings per annum; youths under eighteen, who would benefit by the "Beginners' Section," five shillings per annum. General meetings are to be held on the first and third Fridays in each month, and the sectional meetings as arranged by each section and where they choose. The first general meeting will be held on the third Friday in October (16th), at which the officers and committee for the ensuing year will be elected. Applications for membership and other details to be obtained from the prov. hon. sec., Mr. Walter D. Welford, 47, Hagley-road, Birmingham.

Newcastle-on-Tyne.—At the Art Gallery, on 25th ult., Mr. W. D. Welford, Sub-Editor of *Photography*, gave a humorous and interesting lecture on "Hand Camera Work," illustrated by over two hundred lime-light views. The lecture, which was particularly interesting, was divided as follows: Street Life, The Country Fair, The Rural Fête, Marine Studies, Animals, Athletic, Trips, Home Life. Mr. H. G. Ridgway attended to the lantern, on behalf of Photographic Association.

North Middlesex Photo Society, Jubilee House, Hornsey-road.—September 14, Mr. J. G. Stewart in the chair. Mr. J. Howson, of the Britannia Company, demonstrated the working of "Alpha" paper, and passed round a number of prints. These were admired for their brilliancy, the softness of the half tone, and the transparency of the shadows, as also for the vast range of colour. Mr. Howson then developed and toned a number of prints, showing the range of colours obtainable from equal exposures and development. The audience were much amused at the rough treatment to which the prints were subjected when squeezed during washings. The amusement turned to admiration when the surface of the prints were shown to be quite uninjured by the treatment. The usual competition of prints of views at the society's field-days was held. Mr. Marchant received the vote of merit for Roydon, Mr. Gregory for Loughton, Mr. Staveley for Edgware, and the secretary for Kew.

Sheffield and District Optical Lantern Society.—At a meeting of the above society, held in St. Paul's Schoolroom, on the 24th ult., Mr. Staniforth, vice-president, occupying the chair, Mr. J. T. Frith, the secretary of the society, gave a demonstration on "Bromide enlargement." Mr. Frith, who makes a speciality of this branch of the art, was able to deal with the subject in a manner which proved highly in-

structive and interesting. The lantern used was the "Optimus," and with rapid "Ilford" paper (rough surface) with an exposure of thirty-five seconds, being developed with Feron's Oxalate (Ilford formula) produced excellent results.

—:o:—

Correspondence.

REGULATOR OR GAUGE BURSTING.

[*To the Editor.*]

DEAR SIR,—Does "Inquirer" not know that if gas is suddenly compressed great heat is engendered? Always turn on the tap of gas bottle slowly.—Yours truly,

B. RICHFORD.

[*To the Editor.*]

DEAR SIR,—I am of the opinion that gas bottles have far too large an outlet, and that they should have only a small hole for the gas to escape from. Those blow-ups are either the results of carelessness or inexperience, perhaps both. I remember reading, some time ago, that some firm had introduced an arrangement which prevented the too rapid outlet of the gas, no matter if the cock be turned fully on. Inexperienced lanternists should always have this arrangement on their bottles, and for that matter experienced hands should have it also. I cannot at the moment recall the name of the firm, but if I do I will send it on to you.—Yours, &c.,

ALEX. HAYNES.

[If our correspondent turns to p. 143 of our last issue, he may, perhaps, recall to mind that it was from it that he obtained his information, as we there described a new valve patented by Mr. W. M. Jackson.—ED.]

HOSPITAL LANTERN SOCIETY.

[*To the Editor.*]

SIR.—As the lantern season is now commencing, I think it well to remind your readers that the apparatus kindly given to our committee still remains incomplete. Last season a good deal of work was got through, owing to the kindness of one of the committee, who lent us his jets, dissolver, and regulator. Can some of your readers supply us with these?—Yours truly, J. J. JONES, Secretary.

10, Lydon-road, Clapham, S.W.

—:o:—

Notes and Queries.

T. Hamilton states that he has a lantern objective by Voightlander, 4¼in. diameter lenses, 11in. equivalent focus, and asks for what particular purpose it is suited? *Reply.*—For projecting across a large hall.

Hatter.—If the window is to be used for the display of goods during the day, a thin blind can be rolled down in the evening, and the slide projected from the inside of the shop. If the window is not so used, the glass could be covered with tissue-paper. Ground-glass will answer. We do not see why you should have any difficulty about the matter, unless you are unacquainted with lantern work.

A. B.—We cannot form any idea of the instrument from your letter. Can you send it on to us?

A. Saunders.—(1) We forwarded your inquiry to the patentee, who doubtless has replied to it long before you will see this. (2) Hold the objective a short distance from a piece of white paper fastened on the wall of a room opposite the window. When you observe distant objects in focus, measure the distance from the paper to that part of the lens where the stop is placed, and this will give you its focus. (3) Mostly in France. The makers of your lantern may perhaps polish up the condenser you speak of having scratched.

Zeno writes: "Has any new oil-lamp come out lately which is equal to the limelight? I thought you would be sure to know if it had. I lately read of an operator who had an oil light, which he said, with a 12ft. picture, was nearly equal to the best oxy-hydrogen light he had seen, and much better than many. Kindly let me know what sort of lamp this could have been, and where it can be obtained." *Answer.*—The party who wrote what you state evidently knew little or nothing of the subject. It is quite possible that the oil light in question was better than any oxy-hydrogen light *he had seen*, for it is quite possible to obtain a bad light with limelight. It depends to a large extent upon the capabilities of the operator. We have used oil lamps of every class, and have obtained as high as 85-90 candle-power from them, and this by actual measurement. A limelight that would not give this would indeed be poor.

Ch. Parker writes: "In an early number of this Journal you alluded to limelight jets having a clamp instead of a pin to hold the lime; where can I get a jet with this arrangement?" *Answer.*—We do not know where you can obtain the holder you describe in this country, but all lantern dealers in America keep them.

Perplexed.—If you use a periphery saw for making limes you will find it much more advantageous than turning them on a lathe.

W. R. & T.—We cannot give you the address you mention, but if you send us a letter stamped, we will fill it in and post it to the party you name.

C. M. Fenning writes: "Would it not be a good plan if bi-unial lanterns were separable, so that one need only have to undo a catch or draw a bolt to convert it into two single lanterns? I have a wood-body lantern, which I intend altering in this manner." *Reply.*—Lanterns are made in this style by Messrs. Perken, Son and Rayment.

Marvard says: "I understand that oil in connection with compressed oxygen is apt to cause an explosion, what can I with safety use to lubricate my jet taps, as they turn very stiffly? *Answer.*—There is no danger in putting a little oil on the taps; you will find vaseline a good lubricant for the purpose.

X. Y. Z.—You have made some mistake in your measurements. We never heard of a nipple of a jet having an orifice of 1⅛ inches.

Experiment.—Add a little gelatine to a solution of chloride of cobalt, and coat a piece of glass with it: this while wet will give the pink tint you speak of, which will change to a blue as it dries; dampness will again change it to red.

Subscriber.—You must employ a lantern with an open stage.

Puzzled writes: How is the slide made in which a horse raises and lowers its head? It is a mystery to me. *Answer.*—Paint the horse on one piece of glass and the head and neck on another piece; place these one on the other, so that the head will be in its correct relation to the body. Now slightly rotate the glass with the head and neck, and the mystery will be at once understood.

A. R. Wormald.—Received; in our next.

—:o:—

LANTERN plates do not keep as well as the regular photo and in order to be sure of a good slide the amateur must be sure of good fresh plates, if he depends on a manufacturer for his supply.—*F. C. Beach.*